DOCUMENT RESUME

ED 432 985 IR 019 709

AUTHOR	Anderson, Neil
TITLE	Using Higher Order Computer Tasks with Disadvantaged Students.
PUB DATE	1999-06-00
NOTE	9p.; In: Spotlight on the Future, NECC '99. National Educational Computing Conference Proceedings (20th, Atlantic City, NJ, June 22-24, 1999); see IR 019 708.
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	*Computer Assisted Instruction; Computer Software; Equal Education; Foreign Countries; Instructional Design; Intermediate Grades; Learning Activities; *Learning Disabilities; *Mental Retardation; Peer Teaching; Pilot Projects; Prior Learning; Program Development; *Skill Development; *Special Education; Tutoring
IDENTIFIERS	Technology Integration

ABSTRACT

A pilot program initially designed for a 12-year-old girl with mild to moderate intellectual disabilities in higher order computer tasks was developed for a larger group of students with similar disabilities enrolled in fifth and sixth grades (ages 9-12) at three different schools. An examination of the original pilot study was undertaken to determine critical aspects that led to its success. This paper discusses why further research is needed into the effects of computer interventions in this area, and then focuses on development of the program for the larger group. The first stage of the intervention involved bringing participants together and introducing them to easy-to-use software. Students' interests and needs were ascertained and recorded along with their levels of prior computer experience. Once students worked through several months of less structured, easier computer tasks, they moved on to more structured activities using Microsoft Publisher. Peer tutoring needed to be continued after different steps were mastered. As skills developed, more emphasis was placed on thought-provoking elements of design and how the overall product related to students' interests. During the final stages of the program, SCALA MM200, a multimedia authoring package, was used to further advance the progress of the group, and the same instructional strategies were used with this software. (Contains 20 references.) (AEF)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL
HAS BEEN GRANTED BY
M. Howes

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)
This document has been reproduced as
received from the person or organization
originating it.
Minor changes have been made to
improve reproduction quality.
Points of view or opinions stated in this
document do not necessarily represent
official OERI position or policy.

ED 432 985

Research Paper: Curriculum and Instructional Strategies

Using Higher Order Computer Tasks with Disadvantaged Students

Neil Anderson
Education Queensland
Equity Department
Mary Street
Brisbane, Australia, 4570
nranderson1@peg.apc.org

Key Words: **computer-assisted teaching, learning disabilities, moderate mental retardation, equal education, special education, learning theories**

Summary of the Pilot Study

Just more than four years ago, I described a pilot program that engaged a 12-year-old girl with mild to moderate intellectual disabilities in higher order computer tasks (Anderson, 1995a). The rationale behind the program was that the student, Belinda, needed to improve her communication skills, her self-image, and her social skills in order to be effectively "included" in the regular primary school setting. Studies by Means and Knapp (1991), Gerber (1994) and Sutton (1991) provided the influence to reject simple drill and practice software in favour of alternatives that would provide higher level cognitive challenges. Traditionally, disadvantaged groups have often been overexposed to simple, remedial style "drill and kill" activities at the expense of more thought provoking and creative avenues for learning. Belinda worked on the program intensively during the first year and continued to peer tutor other students during the following two years.

At the completion of the program, results were gathered and published elsewhere (Anderson, 1995b,c, 1996, 1998a) but could be summarized as including increases in spoken and written communication skills, and improvement in social skills, computer skills, and some self-concept areas. A scale of general computer skills was administered individually to the 29 regular class peers and the participant as a post-test measure. Belinda's score of 78.26% was 2.8 standard deviations above the grade norm. This supported the original proposition that she could achieve higher levels than the norm in an area requiring higher order thinking skills. Unfortunately, no formal testing was undertaken to prove the perceived increase in other dimensions,

BEST COPY AVAILABLE

although they were strongly supported by observation from teachers, parents, and independent research teams (Lankshear & Bigum, 1998).

Due to the success of the program and the fact the students with learning or intellectual disabilities displayed some similar problems to Belinda, the program was continued with a larger group as part of a Ph.D. research program. The group chosen included all the students with mild to moderate intellectual disabilities enrolled in Year Five or Six at three different schools. This meant that students selected were not just those with a particular interest in technology and it ensured a wider range of socioeconomic status. Intervention steps were developed, measurement tools and strategies selected, and participants chosen. Interim results from the program were reported at the 1998 Australian Computers in Education Conference (Anderson, 1998a). Full details of these aspects are available at the "Literacy Web Australia" site (Anderson, in press).

An examination of the pilot study was undertaken to determine critical aspects that led to success with Belinda. These were thought to be:

a. The use of software that provided a cognitive challenge as well as being interesting with a potential for "fun."

b. Emphasis during the introduction period was not on text production but rather on using alternative means of expression, such as graphics and labels, and then more text was gradually used.

c. Peer tutoring. After the student mastered aspects of the software, she reinforced this learning by teaching others. This also led to extra spoken dialogue between the student and other members of the class, and contributed to other class members viewing the students as being an "expert" in the computer area. Peer tutoring lessons were provided as part of the intervention.

d. Feedback needed to be given constantly to the student about her progress.

e. Belinda needed to be able to actively experiment with the tools inherent in the software.

Why Do We Need Further Research into the Effects of Computer Interventions in This Area?

Many research studies and meta-analyses of studies with an equity focus concentrate on computer use and the effects of race, gender and social class difference, and more rarely students with learning disabilities. Very rarely do students with intellectual disabilities rate a mention. Sutton (1991) reviewed a decade of research in computers and equity but in her otherwise comprehensive report did not include anything at all about computers and children with intellectual disabilities. Likewise, in the U.S., Becker and Sterling's (1987) review concentrated on race, gender and social status, while an Australian review by Chambers and Clarke (1987) followed the same themes without considering equity issues related to students with intellectual disabilities.

Gardner and Bates (1991, p.98) highlighted that although numerous remarks from special education teachers and professionals assert that computers motivate learning and improve the attitudes of exceptional students, detailed empirical analysis or validation of comparable themes has generally been absent in the literature. A search of the ERIC database with the terms "computers" and "intellectual disabilities" fetched a total blank, whereas "mental retardation" and "computers" revealed only 98 articles. When these were examined to determine studies concerning students with mild to moderate intellectual disabilities, less than 10 remained. Out of these, only two looked at interventions based on higher order or challenging computer tasks and these reports did not contain compelling quantitative or qualitative evidence. These students with mild to moderate intellectual disabilities are the students most likely to be included in regular schools as a result of new legislation in Australia and other countries. This is an area where many teachers are not confident about developing educational programs of any kind, especially in areas such as computing, where they may also lack confidence.

Developing the Program with a Larger Group

The Participants

The selection was a purposeful sample consisting of all the "mainstreamed" students with mild-moderate intellectual disabilities in Years Four, Five, or Six (ages 9-12) who had completed the Queensland State School external ascertainment procedure and who had been ascertained at level five (intellectual) or above. This ascertainment ensures that a full external panel (including parent/caregiver) has confirmed that the student has an IQ level lower than 75 and is seen to require a high level of academic support. This evidence was also cross-referenced with the actual IQ test results and case histories. The group comprised the bulk of students with intellectual disabilities included in regular classrooms in the three schools. The three schools and the representative students cross a wide range of socio-economic family circumstances. All students are included in classrooms that have at least one computer and all classroom teachers have formal school computer curriculums and are expected to fulfill the information technology requirements of the Queensland Education Department syllabus in this area. The students were not selected on the basis of any previous computer experience, talent, or perceived interest in computers. Considering that this level of intellectual disability occurs in a very small incidence of the general population, this is a representative and appropriate sample.

The Intervention Steps with the Larger Group

As it is difficult to change prior negative experiences, it was very important to develop in the participants a positive computer self-concept. The first stage of the intervention involved bringing the participants together and introducing them to some enjoyable and easy to use software. For this study, the computer software, Art for Kids, was used over a period of several months. This software is easy to use, allows for creativity and experimentation, and often leads to the production of quick, positive results. The particular software used here is not critical as long as it is easy to use and enjoyable. Adventure game software or alternative art software such as Kid Pix could be used as a substitute. The important factor is to make the

experience an enjoyable one and free from stress. This is based on Campbell's (1989) study that demonstrated the importance of reducing students' anxiety in relation to computer work. Campbell (1989) found that increased anxiety leads to reduced outcomes with computer work. This is especially important in the initial stages and particularly if the student does not have access to a home computer.

During this initial stage, the students' interests and needs were ascertained and recorded along with their levels of prior computer experience. This information was later used to relate their computer work to their own needs and interests, and to determine the correct time to move students through the steps. Saunders (1992) argued that students develop a personal view of the world and in order to facilitate effective learning, the teacher should gain an insight into this view. Before moving on to the higher order computer work, measures were taken of reading levels, spelling levels, academic and personal self-concept areas, and computer attitudes and self-concepts, and interview questions were administered. Using these prior experiences and student interests in their computer work is a fundamental requirement in constructivist learning theory. This knowledge must be used to pace the students so that they can develop through the steps with the correct amount of scaffolding on the part of the teacher, when needed. The correct amount of scaffolding occurs when the student is given enough help to continue but not too much assistance so that the student is reliant on the teacher (Bransford & Vye, 1989).

Once the students worked through several months of less structured, easier computer tasks, they moved on to more structured activities using Microsoft Publisher. The participants learned how to import clip art based on their chosen interest. For example, if a child had an interest in frogs, the teacher would place different clip art of frogs in a directory ready for the participant's use. Importing of clip art then formed the basis for experimentation in changing the shape or position of the clip art and generally working with clip art for several weeks. Once that skill was mastered, the participants were introduced to peer tutoring skills and attempted to peer tutor other class members about how to import clip art.

Next, the students learned how to use an appropriate border and how to add a WordArt heading. After each section, the acquisition of the skill was reinforced by peer tutoring sessions. As the participants developed with the various skills, there was a build up in the addition of text used in the desktop publishing. The students needed teacher scaffolding in order to gather suitable ideas for the text from the school library, home, and the Internet, and in editing the text used in publications. It is important that the level of scaffolding given is at the correct level, so that it is a challenge for the student but does not become frustrating. It is also important that the teacher discusses the thinking processes used with the children in order to try to increase metacognitive awareness (Peterson, 1988).

Peer tutoring needed to be continued after different steps were mastered. The effectiveness of the peer tutoring was monitored and feedback given from the teacher to help the participants develop their tutoring skills. Students were reminded about the correct steps if they gave inappropriate feedback to the tutees, so that meaningful dialogue continued. Johnson and Johnson's (1986) study supported the idea that peer tutoring can lead to enhanced verbal interactions and

Kulik, Kulik, and Bangert-Drowns (1985) found that the tutor benefited from the process as much as the tutee.

As the skills developed, more emphasis was placed on thought provoking elements of design and how the overall product related to the student's interests. The program should not be reduced to the acquisition of mechanical skills, but should have a purpose and be linked to the student's needs and interests. The thinking processes used should be emphasized and brought out into the open by the teacher and discussed as much as possible, as the program is centered on higher order thinking skills. Becker and Sterling cited in Lepper and Gurtner (1989) and Means and Knapp (1991) found that special needs students are often systematically assigned different and less challenging tasks than other students. The tasks set at each step in this intervention need to be attainable but challenging and creativity and experimentation encouraged.

In the initial implementation of the program, Microsoft Publisher was chosen as the software to provide the necessary challenges. During the final stages it became obvious that new challenges were necessary for the new group to undertake. SCALA MM200 was chosen as an excellent piece of software to further advance the progress of the group and it had the potential to allow transfer and extension of skills gained by using Publisher.

SCALA is a multimedia-authoring package that can be used to produce stand-alone multimedia shows or can be used as an effective presentation tool. Students using Publisher familiarize themselves with concepts such as importing graphics and changing font sizes and styles. SCALA allows this manipulation to a greater degree and extends the students by allowing the importation of animated GIFs and captured video. In order to facilitate the inclusion of video, the school invested in a high quality SVHS camera and a video capture card.

The same instructional strategies employed with Publisher were used with SCALA. The intervention group was introduced to the software before regular class members. After mastering functions of the software they reinforced their skills by tutoring others. Each student chose a topic of interest and then typed sentences relevant to the subject while being instructed in text manipulation via SCALA's different user interface. Later came graphic importation, animated GIF importation, video importation, and transition effects between pages. During the previous work with Publisher, I noticed that students responded positively to tools that created special or unusual effects such as WordArt. SCALA offered spectacular transitions between pages and interesting uses of animated GIFs and movies in different formats. Discussion of design aspects has been a focal point of the intervention and SCALA offered a chance to look at design in relation to a "moving" as opposed to a "static" production and therefore offered more opportunities to cognitively extend the group. Exposure to a different type of user interface proved to be an interesting challenge for the students and provided a good lesson in the diversity of computer tools. Programming could be introduced through editing of scripts, but it was decided that the students would not be able to cope with this level of computing until later in their development. If they later reach a stage where this is possible, the functions are available in the program.

In the presentation, students wrote about themselves and included a digital photo. In the future, video clips of individual students and the class will be included and the presentation will be saved as a stand-alone .EXE file, burnt on CDs, and distributed to parents with the appropriate technology to view them, or be shown at the school.

Now that my work with the larger group is drawing to a close (after two years), I am beginning to review results of formal tests, interviews, school records, videos, and audio tapes, to determine changes in the students' academic scores, communication skills, and social skills. These results will be rigorously examined in the final data analysis section of the Ph.D. document but at this stage it is obvious that many positive changes have occurred, especially in the area of verbal communication and computer skills. One student has been recently reassessed with a Wechsler Intelligence Scale (third edition) as being in the moderate range of intellectual disability (46–58 IQ). This is the lower first percentile intellectual rank, yet her reading age is in the 30th percentile. She is an extremely competent peer tutor as well as being an efficient exponent of desktop publishing. A recent Vinelands Adaptive Behaviour Scale shows only a mild communication deficit. She frequently corresponds with friends in other schools through e-mail and reports enjoying the computer work more than any other area of schoolwork. The original participant now attends the special school for the subjects of English and mathematics and the regular secondary school for art, animal husbandry, and computer studies. She has gained pass levels in the regular computing studies course and hopes to gain employment in a computer related area.

References

Anderson, N. (1995a). No, Belinda set everything up ... QUICK. *Journal of the Queensland Society for Information Technology in Education, 54*, 8–12. Available: http://www.schools.ash.org.au/litweb/page202.html

Anderson, N. (1995b). Inclusive education: Using technology to provide higher cognitive challenges. *Australian Disability Review, 2*, 32–39.

Anderson, N. (1995c). Beyond drill and practice: Higher order thinking skills through technology. *Proceedings of Second Australian Conference on Technology for People with Disabilities*, Adelaide, 167–170.

Anderson, N. (1996). When Technology and Equity Become Partners. Wide Bay Regional SPSS Project. Available: http://www.schools.ash.org.au/litweb/page204.html

Anderson, N. (1998a). Inclusion—Making a difference with technology. *Proceedings of the 1998 Australian Computers in Education Conference*, Adelaide.

Anderson, N. (1998b). Small steps to success with computers. *Education Review—Journal of the Australian Council of Education*, July, 14. Available: http://www.schools.ash.org.au/litweb/steps.html

Anderson, N. (in press). Literacy Web Australia. *Journal of Adolescent and Adult Literacy*. Available: http://www.ed.uiuc.edu/facstaff/chip/jaal/JAAL5-Feb/5web

Becker, H., & Sterling, C. (1987). Equity in school computer use: National data and neglected considerations. *Journal of Educational Computer Research, 3*(3), 289–309.

In L. Resnick & L. Kloper (Eds.), *ASCD yearbook*. Virginia. Bransford, J., & Vye, N. (1989). A perspective on cognitive research and its implications for instruction.

Campbell, J. (1989). Computer anxiety of rural middle and secondary students. *Journal of Educational Computing Research, 5*(2), 213–220.

Chambers, S., & Clarke, V. (1987). Is inequity cumulative? The relationship between disadvantaged group membership and students' computing experience, knowledge, attitudes and intentions. *Journal of Educational Computing Research, 3*(4), 495-517.

Gerber, B. (1994). Beyond drill and practice: Using the computer for creative decisionmaking. *Preventing School Failure, 38*(2), 25-30.

Johnson, D., & Johnson, R. (1986). Computer assisted cooperative learning. *Educational Technology, 26*(1), 12–18.

Kulik, C., Kulik, J., & Bangert-Drowns, R. (1985). Effectiveness of computer based instruction in elementary schools. *Computers in Human Behavior, 1*, 59–74.

Lankshear, C., & Bigum, C. (1998). *Digital rhetorics: Literacies and technologies in education—Current practices and future directions*. Vol. 2 DEETYA Federal Government Report, Australia.

Lepper, M., & Gurtner, J. (1989, February). Children and computers—Approaching the twenty-first century. *American Psychologist*, 170–178.

Literacy Web Australia. [Online] Available: http://www.schools.ash.org.au/litweb/. Preview, U.S. journal edition with Literacy Web Australia review. Available: http://www.ed.uiuc.edu/facstaff/chip/jaal/JAAL5-Feb/index.html

Means, B., & Knapp, M. (1991, December). Cognitive approaches to teaching advanced skills to educationally disadvantaged students. *Phi Delta Kappan*, 282–288.

Saunders, W. (1992). The constructivist perspective: Implications and teaching strategies for science. *School Science and Mathematics, 92*(3), 136–141.

Sutton, R. (1991). Equity and computers in the schools: A decade of research. *Review of Educational Research, 61*(4), p. 475–503.

BEN:LINCS – NECC '99

BEN:LINCS (a case study)

A Community Model for the Pennsylvania Education Network

- **BEN:LINCS**

  Bethlehem Education Network: a Local Instructional Network for Culture and Science

---

- Scott R. Garrigan, EdD
  Bethlehem Area School District
  Coordinator of District Networking
  Bethlehem, PA
  610.807.5571
  sgarrigan@beth.k12.pa.us

Web references:

PA Link-To-Learn URL:
<http://L2L.org>

NECC '99 presentation URL:
<http://www2.beth.k12.pa.us/projects/ben_lincs/pr

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

REPRODUCTION BASIS

☒ This document is covered by a signed "Reproduction Release (Blanket) form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

☐ This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").